# VERIFICATION OF A TRANSLATION

I, the below undersigned translator, hereby state and declare that:

a) My name and post office address are as stated below.

b) That I am well acquainted with the English and Korean languages.

c) That the following is a correct translation into English of the Information Disclosure Form of Samsung Electronics Co., Ltd., for the invention of U.S. Patent Application No. 10/715,402, filed November 19, 2003, and I make the solemn declaration conscientiously believing the same to be true.

May 26, 2006
Date

Minjung Kwak

Signature of Translator

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# DECLARATION

I, Ginny Kang, a Korean citizen of #906, Sung-bo Apartment, Yeoksam-dong, Gangnam-gu, Seoul, Korea do hereby solemnly and sincerely declare as follows:

1. That I am well acquainted with the English and Korean languages.
2. That the following is a correct translation into English of Korean Patent Application No. 2002-86837 filed on December 30, 2002, and I make the solemn declaration conscientiously believing the same to be true.

Seoul, June 1, 2006

Ginny Kang

[DOCUMENT] Application for Patent

[CLASSIFICATION] Patent

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[TITLE OF THE INVENTION-KOREAN] 레버를 이용한 동력 클러치

[TITLE OF THE INVENTION-ENGLISGH] Power clutch that use lever

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[PURPOSE] I, hereby, submit the present application for the Patent under the Article 42 of the Patent Law, and request examination under the Article 60 of Patent

Law. Attorney Hong-sik JEONG (seal)

[Official Fee]

| | | | |
|---|---|---|---|
| [Basic fee] | 20 | pages | \ 29,000 |
| [Additional fee] | 0 | pages | \ 0 |
| [Claiming Priority Right] | 0 | case | \ 0 |
| [Filing Request For Examination] | 6 | claims | \ 301,000 |
| [Total] | | | \ 330,000 |

[Documents] 1. One copy of Abstract, Specification (& drawings)

**[ABSTRACT]**

**[Abstract of the disclosure]**

A driving apparatus of an office machine includes one driving motor, a scanner driving part driving the scanner unit, a printer driving part driving the printer unit, and a power switching part disposed among the driving motor, the scanner driving part and the printer driving part to selectively transmit a power of the driving motor to at least one of the scanner driving part and the printer driving part. Accordingly, a driving apparatus, which has a simple structure using one motor, is able to drive a scanner driving part and a printer driving part, and also, because one driving motor, which is generally very expensive, is required, fabrication cost can be reduced.

**[The main figure]**

FIG. 2

**[Search terms]**

[SPECIFICATION]

**[The title of the invention]**

Driving apparatus for use in a multi-function machine

**[The brief description of the drawings]**

FIG. 1 is a partial perspective view of a general multi-function machine;

FIG. 2 is a schematic perspective view of a driving apparatus of the multi-function machine shown in FIG. 1;

FIG. 3 is a schematic side elevation view of a scanner driving part of the driving apparatus of the multi-function machine shown in FIG. 2;

FIG. 4 is a schematic side elevation view of a printer driving part of the driving apparatus of the multi-function machine shown in FIG. 2;

FIG. 5 is a schematic perspective view of a driving apparatus of a multi-function machine according to the present invention;

FIG. 6 is a schematic side elevation view of the multi-function machine to which the driving apparatus shown in FIG. 5 is applied;

FIG. 7 is a schematic perspective view of a scanner driving part and a scanner driving part of the driving apparatus shown in FIG. 5;

FIG. 8 is a schematic perspective view of a swing gear train of the driving apparatus shown in FIG. 5;

FIGS. 9 and 10 are exploded perspective views of the power switching part of the driving apparatus shown in FIG. 8;

FIGS. 11 and 12 are schematic side elevation views illustrating operation of the power switching part shown in FIG. 8;

FIG. 13 is a top plan view of one modified example of the power switching part of the present invention;

FIG. 14 is a top plan view of another modified example of the power switching part of the present invention;

FIGS. 15a and 15b are partial cross-sectional top plan view and side elevation view of still another modified example of the power switching part of the present invention; and

FIG. 16 is a cross-sectional top plan view of also another modified example of the power switching part of the present invention.

**<Description of the reference numerals in the drawing>**

1: multi-function unit 8,108: paper feed part

10: scanner unit 13,113: paper pickup roller

14,114: paper feed tray 17,117: white roller

18,118: scanner 19,119: paper discharge roller

20,120: scanner driving part 21: scanner driving motor

40: printer unit 41,141: carrier

42,142: paper convey part 43,143: print head

44,144: paper pickup roller 45,145: paper convey roller

46,146: paper discharge roller 51: carrier driving motor

60,160: printer driving part 61: paper feed driving motor

100: driving apparatus 125:satelife gear train

147: paper pickup roller assembly

150,150',150",150"',150"" : power switching part

150a,150a',150a",150a"': clutch

150b,150b',150b",150b"': actuating lever

151,151',151",151"': paper feed clutch gear

152,152',152": intermediate clutch gear

153,153',153",153"': scanner clutch gear

154,154',154",154"': rotation axis

155,155',155",155"': clutch spring

159: power transmitting gear 160a: paper pickup gear train

160b: paper convey/discharge gear train 161: paper feed/scanner driving motor

164: reduction gear 180: swing gear train

**[Detailed description of the invention]**

**[Object of the invention]**

**[The field of the invention and the prior art]**

The present invention relates to a driving apparatus of a multi-function machine having at least a printer function and a scanner function, and more particularly, it relates to a driving apparatus of a multi-function machine which drives a scanner driving part of a scanner unit and a printer driving part of a printer unit with a single driving source.

FIG. 1 shows a general multi-function machine 1. The multi-function machine 1 has a scanner unit 10 to scan data recorded on a sheet of document, and a printer unit 40 to print data on a sheet of paper for an output, as basic components. According to the design, the multi-function machine 1 further includes a facsimile unit to copy data and to transmit or receive data through communication lines.

As shown in FIG. 2 and FIG. 3, the scanner unit 10 includes a document transport part 8 to transport a sheet of document D, a scanner 18 to read data out of the sheet of document D delivered from the document transport part 8, and a scanner driving part 20 to drive the scanner 18.

The document transport part 8 is provided with a document tray 14 to load the sheet of document D, a document sensor 15 to detect whether the sheet of document D is loaded in the document tray 14, a document pickup roller 13 to pick up the sheet of document D according to the operation of the document sensor 15, a friction pad 9 to be in contact with the document pickup roller 13 in a predetermined pressure to separate the sheet of document D sheet by sheet, a white roller 17 to transport the picked-up sheet of document D while bringing the picked-up sheet of document D to be in contact with the scanner 18, and a document discharge roller 19 to discharge the sheet of documents D past through the scanner 18 and the white roller 17 out of the machine 1.

The scanner 18 consists of a contact image sensor (CIS; not shown) mounted on a scanner frame 3 to read data out of the sheet of document D.

The scanner driving part 20, which is disposed on the scanner frame 3, is composed of a scanner driving motor 21, a scanner driving gear 22 formed at the scanner driving motor 21, and a plurality of engaging gears 23, 25, 26, 27, 29, 30, and 32 and a first reduction gear 24 to transmit a rotation force of the scanner driving gear 21 to a document pickup roller gear 28, a white roller gear 31, and a document discharge roller gear 33.

As shown in FIG. 4, the printer unit 40 includes a carrier 41 having a print head 43

with an ink jet nozzle mounted thereon, a carrier frame 12 to support a guide rail 11 and a carrier shaft 49 guiding the movement of the carrier 41, a carrier driving part 50 to move the carrier 42 right and left along the carrier shaft 49, a paper transport part 42 to transport a sheet of paper P loaded in a paper cassette 48 and a printer driving part 60 to drive the paper transport part 42.

The carrier 41 is provided with a guide slider 56 formed at a rear and upper side thereof to be movable right and left along the guide rail 11, and a support bracket 47 supported on the carrier shaft 49 to be movable right and left therealong.

As shown in FIG. 2, the carrier driving part 50 is composed of a carrier driving motor 51 fixed on the carrier frame 12 below the guide rail 11, and a carrier driving belt 53 connected with a carrier driving gear 52 of the carrier driving motor 51 to transmit a power of the carrier driving motor 51 to a power transmitting teeth portion 54 (FIG. 1) of the support bracket 47 formed at the rear side of the carrier 41, thereby to move the carrier 41 right and left.

The paper transport part 42 is composed of a paper pickup roller 44 to pick up the sheet of paper P to be printed, a paper transport roller 45 to transport the sheet of paper P picked-up by the paper pickup roller 44, and a paper discharge roller 46 to discharge the sheet of paper P.

The printer driving part 60 consists of a paper feed driving motor 61 fixed on a lower side of a paper feed frame 5 (FIG. 1), a paper-feed driving gear 62 formed at the paper-feed driving motor 61, and a plurality of engaging gear 63, 65, 66, 67, 69, 70, 71 and 75 and second reduction gears 64, 68 and 73 to transmit the rotation force of the driving motor gear 62 to a paper pickup roller gear 72, paper transport roller gear 74, and a paper discharge roller gear 76.

In operation of the multi-function machine 1 constructed above, during a scanning mode for copying or transmitting data recorded in the sheet of document P, the scanner driving motor 21 drives the scanner driving part 20 to operate the scanner unit 10, and during a printing mode for printing, the paper-feed driving motor 61 and the carrier driving motor 51 drive respectively the printer driving part 60 and the carrier driving part 50 to operate the printer unit 40.

However, such a conventional multi-function machine 1 has an advantage that since the scanner driving part 20 and the printer driving part 60 disposed to have same power transmitting direction are respectively driven by separate motors 21 and 51, a structure and a method of driving the scanner unit 10 and the printer unit 40 to carry out the scanning and

printing operations can be easily embodied, but presents a problem that a fabrication cost increases owing to using of two high-priced driving motors.

**[Technical object of the invention]**

The present invention has been devised to solve the above problems, so it is an aspect of the present invention to provide a driving apparatus of a multi-function machine which is able to drive a scanner driving part of a scanner unit and a printer driving part of a printer unit by one driving motor, and thereby to reduce a fabrication cost.

**[Construction and operation of the invention]**

According to one embodiment of the present invention to achieve the above aspects and other features of the present invention, the present invention provides a driving apparatus of a multi-function machine including a scanner unit scanning data recorded on a sheet of document and having a document transport part to transport the sheet of document, and a printer unit printing data on a sheet of paper for an output and having a carrier including a print head with an ink jet nozzle mounted thereon to carry out the printing operation by moving the print head, comprising one driving motor, a scanner driving part driving the scanner unit, a printer driving part driving the printer unit, and a power switching part disposed among the driving motor, the scanner driving part and the printer driving part to selectively transmit a power of the driving motor to at least one of the scanner driving part and the printer driving part.

The power switching part is composed of a first clutch disposed among the among the driving motor, the scanner driving part and the printer driving part to move between a first power transmitting position transmitting the power of the driving motor to the scanner driving part and a second power transmitting position transmitting the power of the driving motor to the printer driving part, and a first actuating lever disposed on a moving path of the carrier to be actuated by the carrier, thereby to move the first clutch between the first power transmitting position and the second power transmitting position.

The first clutch is provided with a first rotation axis disposed at a frame, a first paper-feed clutch gear disposed at the first rotation axis to engage with the printer driving part and having first paper-feed clutch teeth formed on a face thereof, a first scanner clutch gear disposed at the first rotation axis to engage with the scanner driving part and having first scanner clutch teeth formed on a face thereof which is located toward the first paper-feed clutch teeth, a first middle clutch gear disposed at the first rotation axis between the first paper-feed clutch gear and the first scanner clutch gear to engage with the driving motor and

having first homologous paper-feed clutch teeth formed on one face thereof opposite to the first paper-feed clutch teeth to engage with the first paper-feed clutch teeth, and first homologous scanner clutch teeth formed on the other face thereof opposite to the first scanner clutch teeth to engage with the first scanner clutch teeth, and a first clutch spring disposed between the first middle clutch gear and the first scanner clutch gear to elastically urge the first middle clutch gear toward the first paper-feed clutch gear, thereby to allow the first homologous paper-feed clutch teeth of the first middle clutch gear to engage with the first paper-feed clutch teeth of the first paper-feed clutch gear. At this time, preferably, the first paper-feed clutch teeth, the first scanner clutch teeth, the first homologous paper-feed clutch teeth and the first homologous scanner clutch teeth are respectively formed of a plurality of teeth, each having a cross section such as a triangle, a rectangle, a trapezoid and the like to easily switch the power to be transmitted, which are formed at the corresponding faces of the gears.

The first actuating lever has a first one end disposed between the first middle clutch gear and the first paper-feed clutch gear to move between a first paper-feed driving position and a first scanner driving position, the first paper-feed driving position being a position which the first one end allows the first homologous paper-feed clutch teeth to engage with the first paper-feed clutch teeth, and the first scanner driving position being a position which the first one end moves the first middle clutch gear toward the first scanner clutch gear against a force of the first clutch spring to allow the first homologous paper-feed clutch teeth to disengage from the first paper-feed clutch teeth and to allow the first homologous scanner clutch teeth to engage with the first scanner clutch teeth, a first other end disposed on the moving path of the carrier to be actuated by the carrier when the carrier is moved and thereby to move the first one end to the first scanner driving position, and a first middle portion having a first support axis supported at the frame to allow the first one end to be movable between the first paper-feed driving position and the first scanner driving position by the first other end.

Alternatively, the power switching part of the present invention can be composed of a second clutch disposed among the among the driving motor, the scanner driving part and the printer driving part to move between a third power transmitting position transmitting the power of the driving motor to the printer driving part and a fourth power transmitting position transmitting the power of the driving motor to both the printer driving part and the scanner driving part, and a second actuating lever disposed on a moving path of the carrier to be actuated by the carrier, thereby to move the second clutch between the third power

transmitting position and the fourth power transmitting position.

At this case, a driving motor gear of the driving motor can be composed of first and second gears that are coaxially disposed in a spaced-apart relation with each other, one elongated gear that are extended in the axial direction, or a gear having a general width.

If the driving motor gear of the driving motor is composed of the first and second gears which are coaxially disposed in a spaced-apart relation with each other, the second clutch can be provided with a second rotation axis disposed at a frame, a second paper-feed clutch gear disposed at the second rotation axis to engage with the printer driving part and the first gear of the driving motor, a second scanner clutch gear disposed at the second rotation axis to engage with the scanner driving part and having second scanner clutch teeth formed on a face thereof which is located toward the second paper-feed clutch gear, a second middle clutch gear disposed at the second rotation axis between the second paper-feed clutch gear and the second scanner clutch gear to engage with or disengage from the second gear of the driving motor and having second homologous scanner clutch teeth formed on one face thereof opposite to the second scanner clutch teeth to engage with the second scanner clutch teeth, and a second clutch spring disposed between the second middle clutch gear and the second scanner clutch gear to elastically urge the second middle clutch gear toward the second paper-feed clutch gear, thereby to allow the second middle clutch gear to disengage from the second gear of the driving motor and at the same time to allow the second homologous scanner clutch teeth of the second middle clutch gear to disengage from the second scanner clutch teeth of the second scanner clutch gear. At this time, preferably, the second scanner clutch teeth and the second homologous scanner clutch teeth are respectively formed of a plurality of teeth, each having a cross section such as a triangle, a rectangle, a trapezoid and the like to easily switch the power to be transmitted, which are formed at the corresponding faces of the gears.

Also, the second actuating lever can have a second one end disposed between the second middle clutch gear and the second paper-feed clutch gear to move between a second paper-feed driving position and a first paper-feed/scanner driving position, the second paper-feed driving position being a position which the second one end allows the second middle clutch gear to disengage from the second gear of the driving motor and at the same time allows the second homologous scanner clutch teeth to disengage from the second scanner clutch teeth, and the first paper-feed/scanner driving position being a position which the second one end moves the second middle clutch gear toward the second scanner clutch gear against a force of the second clutch spring to allow the second middle clutch gear to engage

with the second gear of the driving motor and at the same time to allow the second homologous scanner clutch teeth to engage with the second scanner clutch teeth, a second other end disposed on the moving path of the carrier to be actuated by the carrier when the carrier is moved and thereby to move the second one end to the first paper-feed/scanner driving position, and a second middle portion having a second support axis supported at the frame to allow the second one end to be movable between the second paper-feed driving position and the first paper-feed/scanner driving position by the second other end.

Further, if the driving motor gear of the driving motor is composed of the one elongated gear which are extended in the axial direction, the second clutch can be provided with a third rotation axis disposed at a frame, a third paper-feed clutch gear disposed at the third rotation axis to always engage with the printer driving part and one end of the driving motor gear, a third scanner clutch gear disposed at the third rotation axis to engage with the scanner driving part and having third scanner clutch teeth formed on a face thereof which is located toward the third paper-feed clutch gear, a third middle clutch gear disposed at the third rotation axis between the third paper-feed clutch gear and the third scanner clutch gear to always engage with the other end of the driving motor gear of the driving motor and having third homologous scanner clutch teeth formed on one face thereof opposite to the third scanner clutch teeth to engage with the third scanner clutch teeth, and a third clutch spring disposed between the third middle clutch gear and the third scanner clutch gear to elastically urge the third middle clutch gear toward the third paper-feed clutch gear, thereby to allow the third homologous scanner clutch teeth of the third middle clutch gear to disengage from the third scanner clutch teeth of the third scanner clutch gear. At this time, preferably, the third scanner clutch teeth and the third homologous scanner clutch teeth are respectively formed of a plurality of teeth, each having a cross section such as a triangle, a rectangle, a trapezoid and the like to easily switch the power to be transmitted, which are formed at the corresponding faces of the gears.

Also, the second actuating lever can have a third one end disposed between the third middle clutch gear and the third paper-feed clutch gear to move between a third paper-feed driving position and a second paper-feed/scanner driving position, the third paper-feed driving position being a position which the third one end allows the third homologous scanner clutch teeth to disengage from the third scanner clutch teeth, and the second paper-feed/scanner driving position being a position which the third one end moves the third middle clutch gear toward the third scanner clutch gear against a force of the third clutch spring to allow the third homologous scanner clutch teeth to engage with the third scanner clutch teeth,

a third other end disposed on the moving path of the carrier to be actuated by the carrier when the carrier is moved and thereby to move the third one end to the second paper-feed/scanner driving position, and a third middle portion having a third support axis supported at the frame to allow the third one to be movable end between the third paper-feed driving position and the second paper-feed/scanner driving position by the third other end.

Still further, if the driving motor gear of the driving motor is composed of the gear having a general width, the second clutch can be provided with a fourth rotation axis disposed at a frame, a fourth paper-feed clutch gear disposed at the fourth rotation axis to engage with the printer driving part and the driving motor and having at least one fourth paper-feed clutch tooth formed on one face thereof, a fourth scanner clutch gear disposed at the fourth rotation axis to engage with the scanner driving part and having fourth scanner clutch teeth formed on a face thereof which is located toward the fourth paper-feed clutch tooth, a fourth middle clutch gear disposed at the fourth rotation axis between the fourth paper-feed clutch gear and the fourth scanner clutch gear and having at least one fourth homologous paper-feed clutch tooth formed on an inner circumference surface thereof opposite to the fourth paper-feed clutch tooth to engage with the fourth paper-feed clutch tooth and fourth homologous scanner clutch teeth formed on a face thereof opposite to the fourth scanner clutch teeth to engage with the fourth scanner clutch teeth, and a fourth clutch spring disposed between the fourth middle clutch gear and the fourth scanner clutch gear to elastically urge the fourth middle clutch gear toward the fourth paper-feed clutch gear, thereby to allow the fourth middle clutch gear to separate from the fourth scanner clutch gear. At this time, preferably, the fourth paper-feed clutch tooth and the fourth homologous paper-feed clutch tooth are respectively formed of a first sliding boss projected in the axial direction from the one face of the fourth paper-feed clutch gear and a first sliding boss-engaging portion formed in the inner circumference surface of the fourth middle clutch gear to receive the first sliding boss to be slidable in the axial direction, so that the fourth paper-feed clutch tooth is always engaged with the fourth homologous paper-feed clutch tooth to transmit a power of the driving motor. The first sliding boss has one of a first sliding key and a first sliding tooth formed to be extended in the axial direction on an outer circumference surface thereof, and the first sliding boss-engaging portion has a first receiving groove formed in a shape corresponding to one of the first sliding key and the first sliding tooth at the inner circumference surface of the fourth middle clutch gear. Also, preferably, the fourth scanner clutch teeth and the fourth homologous scanner clutch teeth are respectively formed of a plurality of teeth, each having a cross section such as a triangle, a rectangle, a trapezoid and the like to easily switch the

power to be transmitted, which are formed at the corresponding face of the gears.

The second actuating lever can have a fourth one end disposed between the fourth middle clutch gear and the fourth paper-feed clutch gear to move between a fourth paper-feed driving position and a third paper-feed/scanner driving position, the fourth paper-feed driving position being a position which the fourth one end allows the fourth homologous scanner clutch teeth to disengage from the fourth scanner clutch teeth, and the third paper-feed/scanner driving position being a position which the fourth one end moves the fourth middle clutch gear toward the fourth scanner clutch gear against a force of the fourth clutch spring to allow the fourth homologous scanner clutch teeth to engage with the fourth scanner clutch teeth, a fourth other end disposed on the moving path of the carrier to be actuated by the carrier when the carrier is moved and thereby to move the fourth one end to the third paper-feed/scanner driving position, and a fourth middle portion having a fourth support axis supported at the frame to allow the fourth one end to be movable between the fourth paper-feed driving position and the third paper-feed/scanner driving position by the fourth other end.

Also, if the driving motor gear of the driving motor is composed of the gear having a general width, the second clutch can be provided with a fifth rotation axis disposed at a frame, a fifth paper-feed clutch gear disposed at the fifth rotation axis to engage with the printer driving part and the driving motor and having at least one fifth paper-feed clutch tooth formed on one face thereof, a fifth scanner clutch gear disposed at the fifth rotation axis to be movable between a paper-feeding position and a paper-feeding/scanning position and having at least one fifth scanner clutch tooth formed at an inner circumference surface thereof to engage the fifth paper-feed clutch tooth, the paper-feeding/scanning position being a position which the fifth scanner clutch gear is engaged with the scanner driving part and the paper-feeding position being a position which fifth scanner clutch gear is disengaged from the scanner driving part, and a fifth clutch spring disposed between the fifth scanner clutch gear and a top of the fifth rotation axis to elastically urge the fifth scanner clutch gear toward the fifth paper-feed clutch gear to maintain the fifth scanner clutch gear at the paper-feeding position. At this time, preferably, the fifth paper-feed clutch tooth and the fifth scanner clutch tooth are respectively formed of a second sliding boss projected in the axial direction from the one face of the fifth paper-feed clutch gear and a second sliding boss-engaging portion formed at the inner circumference surface of the fifth scanner clutch gear to receive the second sliding boss to be slidable in the axial direction, so that the fifth paper-feed clutch tooth is always engaged with the fifth scanner clutch tooth to transmit a power of the driving motor. The second sliding boss the has one of a second sliding key and a second sliding tooth

formed to be extended in the axial direction on an outer circumference surface thereof, and the second sliding boss-engaging portion has a second receiving groove formed in a shape corresponding to one of the second sliding key and the second sliding tooth at the inner circumference surface of the fifth scanner clutch gear.

Also, the second actuating lever can have a fifth one end disposed between the fifth scanner clutch gear and the fifth paper-feed clutch gear to move between a fifth paper-feed driving position and a fourth paper-feed/scanner driving position, the fifth paper-feed driving position being a position which the fifth one end allows the fifth scanner clutch gear to be maintained at the paper-feeding position, and the fourth paper-feed/scanner driving position being a position which the fifth one end moves the fifth scanner clutch gear toward the scanner driving part against a force of the fifth clutch spring to allow the fifth scanner clutch gear to be maintained at the paper-feeding/scanning position, a fifth other end disposed on the moving path of the carrier to be actuated by the carrier when the carrier is moved and thereby to move the fifth one end to the fourth paper-feed/scanner driving position, and a fifth middle portion having a fifth support axis supported at the frame to allow the fifth one end to be movable between the fifth paper-feed driving position and the fourth paper-feed/scanner driving position by the fifth other end.

To facilitate a gear assembling between the power switching part and the scanner driving part, the driving apparatus of the multi-function machine of the present invention further includes a swing gear train disposed between the power switching part and the scanner driving part.

Hereinafter, a driving apparatus of a multi-function machine according to the present invention will be described in greater detail with reference to the accompanying drawings.

Like as the conventional multi-function machine 1 explained with reference to FIGS. 1 and 2, the multi-function machine has a scanner unit 110 to scan data recorded on a sheet of document, and a printer unit 140 to print data on a sheet of paper for an output, as basic components. According to the design, the multi-function machine further includes a facsimile unit (not shown) to copy data and to transmit or receive data through communication lines.

FIG. 6 shows a multi-function machine to which a driving apparatus 100 of the present invention is applied.

As shown in FIG. 6, the scanner unit 110 is provided with a document transport part 108 to transport a sheet of document D, and a scanner 118 to read data out of the sheet of document D delivered from the document transport part 108, and the printer unit 140 is provided with a carrier 141 having a print head 143 with a ink jet nozzle mounted thereon, a

carrier driving part (not shown) to move the carrier 141 right and left along a carrier shaft 149, and a paper transport part 142 to transport a sheet of paper P stacked in a paper cassette 148.

The description about the constructions of the above elements will be omitted here, as they are identical to that of the conventional ones that are described above with reference to FIGS.1 and 2.

FIG. 5 schematically shows the driving apparatus 100 of the multi-function machine according to the present invention.

The driving apparatus 100 includes a paper-feed/scanner driving motor 161 disposed at a paper feed frame 105, a scanner driving part 120 to drive the document transport part 108, a printer driving part 160 to drive the paper transport part 142, and a first power switching part 150 disposed with respect to the paper-feed/scanner driving motor 161 to be actuated by the carrier 141, thereby to transmit a power of the paper-feed/scanner driving motor 161 to the printer driving part 142 when the carrier 141 is positioned at a printing region, and to the scanner driving part 120 when the carrier 141 is positioned at a non-printing region.

Referring to FIG. 6 and 7, the scanner driving part 120 is provided with a first power transmitting gear 159 disposed at the paper feed frame 105 to engage with a first scanner clutch gear 153 of the power switching part 150 as described later, a swing gear train 180 at disposed at the paper feed frame 105 to engage with the first power transmitting gear 159, a second power transmitting gear 123 disposed at a scanner frame 105' (FIG. 8) to engage with the swing gear train 180, a first reduction gear 124 disposed at the scanner frame 105' to engage with the second power transmitting gear 123, a satellite gear train 125 engaging with a small gear 124a of the first reduction gear 124, a document pickup gear train 126, 127 and 128 engaging with the satellite gear train 125 to pick up the sheet of document D, and a document transport and discharge gear train 130, 131, 132, and 133 engaging with the satellite gear train 125 to transport and discharge the sheet of document D.

The swing gear train 180 is composed of a swing gear 181 engaging with the first power transmitting gear 159, first and second idle gears 182 and 183 engaging with the swing gear 181, and a V-shaped swing lever 184 interconnecting the swing gear 181 and the first and second idle gears 182 and 183 to be engaged with one another. The swing gear train 180 functions to facilitate the gear assembling between the first power transmitting gear 159 disposed at the paper feed frame 105 and the second power transmitting gear 123 disposed at the scanner frame 105', and also to increase the degree of freedom in design therebetween.

The satellite gear train 125 has first and second satellite gears 125a and 125b disposed around the small gear 124a of the second reduction gear 124 to engage therewith, and a I-

shaped satellite lever 125c mounting the first and second gears 125a and 125b to engage with the small gear 124a.

The document pickup gear train 126, 127 and 128 is composed of a third power transmitting gear 126 engaging or disengaging with or from the first satellite gear 125a of the satellite gear train 125 according to the rotation direction of the satellite gear train 125, a fourth power transmitting gear 127 engaging with the third power transmitting gear 126, and a document pickup roller gear 128 coaxially formed with a document pickup roller 113 to transmit the power thereto and engaging with the fourth power transmitting gear 127.

The document transport/discharge gear train 130, 131, 132, and 133 is composed of a fifth power transmitting gear 130 engaging or disengaging with or from the second satellite gear 125b of the satellite gear train 125 according to the rotation direction of the satellite gear train 125, a white roller gear 131 disposed on an upper side of the fifth power transmitting gear 130 to engage therewith and coaxially formed with a white roller 117 to transmit the power thereto, a sixth power transmitting gear 132 disposed under the fifth power transmitting gear 130 to engage therewith, and a document discharge roller gear 133 coaxially formed with a document discharge roller 119 to transmit the power thereto and engaging with the sixth power transmitting gear 132.

Accordingly, when the first power transmitting gear 159 of the scanner driving part 120 is rotated in the clockwise direction by the rotation of the paper-feed/scanner driving motor 161 in one direction, i.e. the clockwise direction, the document pickup roller 113 is clockwise through the swing gear 181, the first idle gear 182, the second power transmitting gear 123, the small gear 124a of the first reduction gear 124, the first satellite gear 125a, the third and fourth power transmitting gears 126 and 127, and the document pickup roller gear 128 to pick up the sheet of document D, and the white roller 117 is rotated in the counterclockwise direction through the swing gear 181, the first idle gear 182, the second power transmitting gear 123, the small gear 124a of the first reduction gear 124, the second satellite gear 125b, the fifth power transmitting gear 130 and the white roller gear 131 to transport the sheet of document D in contact with the scanner 118.

Also, at this time, the document discharge roller 119 is rotated in the clockwise direction through the swing gear 181, the first idle gear 182, the second power transmitting gear 123, the small gear 124a of the first reduction gear 124, the second satellite gear 125b, the fifth power transmitting gear 130, the sixth power transmitting gear 132 and the document discharge roller gear 133 to discharge the sheet of document D.

On the contrary, when the first power transmitting gear 159 is rotated in the

counterclockwise direction by the rotation of the paper-feed/scanner driving motor 161 in the other direction, i.e. the counterclockwise direction, the power transmitted to the satellite gear train 125 through the swing gear 181, the second idle gear 183, the second power transmitting gear 123, and the small gear 124a of the first reduction gear 124 is not transmitted to the document pickup roller 113, the white roller 117 and the document discharge roller 119, but blocked, since the first and second satellite gears 125a and 125b are separated respectively from the third and fifth power transmitting gear 126 and 130 as the satellite gear train 125 is rotated in the counterclockwise direction.

Referring again to FIGS. 5 and 6, the printer driving part 160 is provided with a second reduction gear 164 disposed at the paper feed frame 105 to engage with a first paper-feed clutch gear 151 of the power switching part 150 as described later, a paper pickup gear train 160a engaging with the second reduction gear 164 to pick up the sheet of paper P, and a paper transport/discharge gear train 160b engaging the second reduction gear 164 to discharge the sheet of paper P.

The paper pickup gear train 160a has a seventh power transmitting gear 165 engaging with a small gear 164a of the second reduction gear 164, a third reduction gear 166 engaging with the seventh power transmitting gear 165, a eighth power transmitting gear 167 having a driven teeth 167a connected with a driving teeth 166a of the third reduction gear 166, a ninth power transmitting gear 168 engaging with the eighth power transmitting gear 167, a paper pickup roller assembly 147 (FIG. 5) coaxially formed with a tenth power transmitting gear 169 to be connected thereto.

The paper pickup roller assembly 147 has an eleventh power transmitting gear 169b formed on an end opposite to an end of axis 169a on which the a tenth power transmitting gear 169 is formed, a first pickup idle gear 170 engaging with the eleventh power transmitting gear 169b, a second pickup idle gear 171 engaging with the first pickup idle gear 170, and a paper pickup roller gear 172 coaxially formed with the paper pickup roller 144 to drive the paper pickup roller 144 and engaging with the second pickup idle gear 171.

To idle the paper pickup roller 144 during paper feeding after paper picking-up, the paper pickup roller assembly 147 includes a well-known one-way power transmitting device formed at an appropriate position between the paper pickup roller 144 and the paper pickup roller gear 172.

The paper transport/discharge gear train 160b has a fourth reduction 173 engaging with the small gear 164a of the second reduction gear 164, a paper transport gear 174 engaging with a small gear 173a of the fourth reduction gear 173, a twelfth power

transmitting gear 175 engaging with the paper transport gear 174, and a paper discharge roller gear 176 engaging with the twelfth power transmitting gear 175.

Accordingly, when the second reduction gear 164 of the printer driving part 160 is rotated in the counterclockwise direction by the rotation of the paper-feed/scanner driving motor 161 in the counterclockwise direction, the paper pickup roller 144 is rotated in the counterclockwise direction through the seventh power transmitting gear 165, the eighth power transmitting gear 167, the ninth power transmitting gear 168, the tenth power transmitting gear 169, the eleventh power transmitting gear 169b, the first and second pickup idle gears 170 and 171, and the paper pickup roller gear 172 to pick up the sheet of paper P.

On the contrary, when the second reduction gear 164 of the printer driving part 160 is rotated in the clockwise direction by the rotation of the paper-feed/scanner driving motor 161 in the clockwise direction, the paper pickup roller 144 is idled by the one-way power transmitting device of the paper pickup roller assembly 147, whereas the paper transport roller 145 is rotated in the clockwise direction through the fourth reduction roller 173 and the paper transport roller gear 174 to transport the sheet of paper P and the paper discharge roller 146 is rotated in the clockwise direction through the fourth reduction gear 173, the paper transport roller gear 174, the twelfth power transmitting gear 175, and the paper discharge roller gear 176 to discharge the sheet of paper P.

As shown in FIGS, 8, 9 and 10, the first power switching part 150 is provided with a first clutch 150a disposed among the among the driving motor 161, the scanner driving part 120 and the printer driving part 160 to move between a first power transmitting position (FIG. 12) transmitting the power of the driving motor 161 to the first power transmitting gear 159 of scanner driving part 120 and a second power transmitting position (FIG. 11) transmitting the power of the driving motor 161 to the second reduction gear 164 of the printer driving part 160, and a first actuating lever 150b disposed on a moving path of the carrier 141 to assure the first clutch 150a to be movable between the first power transmitting position and the second power transmitting position by the carrier 141.

The first clutch 150a comprises a first rotation axis 154 disposed at the paper feed frame 105, a first paper-feed clutch gear 151 disposed at the first rotation axis 154 to engage with the second reduction gear 164 the printer driving part 160 and having first paper-feed clutch teeth 151a formed on a face thereof, a first scanner clutch gear 153 disposed at the first rotation axis 154 to engage with the first power transmitting gear 159 of the scanner driving part 120 positioned thereon and having first scanner clutch teeth 153a formed on a face thereof which is located toward the first paper-feed clutch teeth 151a, a first middle clutch

gear 152 disposed at the first rotation axis 154 between the first paper-feed clutch gear 151 and the first scanner clutch gear 153 to engage with a driving motor gear 162 of the driving motor 161 and having first homologous paper-feed clutch teeth 152a formed on one face thereof opposite to the first paper-feed clutch teeth 151a to engage therewith and first homologous scanner clutch teeth 152b formed on the other face thereof opposite to the first scanner clutch teeth 153a to engage therewith, and a first clutch spring 155 disposed between the first middle clutch gear 152 and the first scanner clutch gear 153.

The first clutch spring 155 functions to elastically urge the first middle clutch gear 152 toward the first paper-feed clutch gear 151, thereby to allow the first homologous paper-feed clutch teeth 152a of the first middle clutch gear 152 to engage with the first paper-feed clutch teeth 151a of the first paper-feed clutch gear 151.

The first paper-feed clutch teeth 151a, the first scanner clutch teeth 153a, the first homologous paper-feed clutch teeth 152a and the first homologous scanner clutch teeth 152b are respectively formed of a plurality of teeth, each having a cross section such as a triangle, a rectangle, a trapezoid and the like to easily switch the power, which are formed at the corresponding faces of the gears 151, 152 and 153 to be engaged or disengaged with each other when the first middle clutch gear 152 is moved in an axial direction on the first rotation axis 154.

The first actuating lever 150b has a first ring-shaped one end 156a disposed at the first rotation axis 154 between the first middle clutch gear 151 and the first paper-feed clutch gear 152 to move between a first paper-feed driving position (FIG. 11) and a first scanner driving position (FIG. 12) and having a hole to receive the first rotation axis 154, a first other end 156b disposed on the moving path of the carrier 141 to be actuated by the carrier 141 when the carrier is moved to the non-printing region and thereby to move the first one end 156a to the first scanner driving position, and a first middle portion 156c having a first support axis 158 supported at the paper feed frame 105 to allow the first one end 156a to be movable between the first paper-feed driving position and the first scanner driving position by the first other end 156b. The first paper-feed driving position is a position which the first one end 156a allows the first homologous paper-feed clutch teeth 152a to engage with the first paper-feed clutch teeth 151a, and the first scanner driving position is a position which the first one end 156a moves the first middle clutch gear 152 toward the first scanner clutch gear 153 against a force of the first clutch spring 155 to allow the first homologous paper-feed clutch teeth 152a to disengage from the first paper-feed clutch teeth 151a and to allow the first homologous scanner clutch teeth 152b to engage with the first scanner clutch teeth 153a.

The first actuating lever 150b is always maintained at the first paper-feed driving position by a first support spring 157 having both ends supported by first and second support protrusions 157a and 157b and a middle portion fixed on the first support axis 158.

Accordingly, as shown in FIG. 11, when the carrier 141 is moved in the direction of arrow A and positioned at the printing region, the first actuating lever 150b is positioned at the first paper-feed driving position by the first support spring 157 and the first clutch spring 155, so that the first homologous paper-feed clutch teeth 152a of the first middle clutch gear 152 is engaged with the first paper-feed clutch teeth 151a of the first paper-feed clutch gear 151 to transmit the power of the paper-feed/scanner driving motor 161 to the second reduction gear 164 of the printer driving part 160.

To the contrary, as shown in FIG. 12, when the carrier 141 is moved in the direction of arrow B and positioned at the non-printing region, the first actuating lever 150b is rotated in the clockwise direction about the first support axis 158 by the carrier 141 to move first middle clutch gear 152 toward the first scanner clutch gear 153 against the first support spring 157 and the first clutch spring 155 and then positioned at the first scanner driving position, so that the first homologous paper-feed clutch teeth 152a of the first middle clutch gear 152 is disengaged from the first paper-feed clutch teeth 151a of the first paper-feed clutch gear 151 and at the same time, the first homologous scanner clutch teeth 152b of the first middle clutch gear 152 is engaged with the first scanner clutch teeth 153a of the first scanner clutch gear 153 to transmit the power of the paper-feed/scanner driving motor 161 to the first power transmitting gear 159 of the scanner driving part 120.

The operations of the driving unit 100 of the present invention structured above will be described with reference to Fig. 5 to Fig. 12.

First, assuming that the carrier 141 is positioned at the non-printing region as shown in FIG. 12, the first actuating lever 150b is positioned at the first scanner driving position that the first homologous paper-feed clutch teeth 152a is separated from the first paper-feed clutch teeth 151a so as not to transmit the power of the paper-feed/scanner driving motor 161 to the second reduction gear 164 and the first homologous scanner clutch teeth 152b is engaged with the first scanner clutch teeth 153a to transmit the power of the paper-feed/scanner driving motor 161 to the first power transmitting gear 159 of the scanner driving part 120.

At this state, as shown in FIG. 6, to copy or transmit data recorded in a sheet of document D, when the sheet of document D is loaded in the document tray 111, it slides down due to its own weight and operate the document sensor 115. As a result, the controller (not shown) applies electric power to the paper-feed/scanner driving motor 161 so that the

driving motor gear 162 rotates in one way, for example, in the clockwise direction indicated in the arrow of solid line of Fig. 6.

The driving force of the driving motor gear 162 in the clockwise direction is transmitted to the document pickup roller 113 through the first middle clutch gear 152, the first scanner clutch gear 153, the first power transmitting gear 159, the swing gear 181, the first idle gear 182, the second power transmitting gear 123, the small gear 124a of the first reduction gear 124, the first satellite gear 125a, the third and fourth power transmitting gears 126 and 127, and the document pickup roller gear 128, so that the document pickup roller 113 is rotated in the clockwise direction to pick up and feed the sheet of document D until it is arrived at the document sensor 116.

After the sheet of document D arrives at the document sensor 116when a copy or electrical transmission button is pushed, the driving motor 161 is again rotated in the clockwise direction such that the sheet of document D is conveyed toward the scanner 118 by the first pickup roller 113.

When the sheet of document D arrives at the scanner 118, the white roller 117, which is rotated in the counterclockwise direction through the first middle clutch gear 152, the first scanner clutch gear 153, the first power transmitting gear 159, the swing gear 181, the first idle gear 182, the second power transmitting gear 123, the small gear 124a of the first reduction gear 124, the second satellite gear 125b, the fifth power transmitting gears 130, and the white roller gear 131, moves the sheet of document in contact with the scanner 118 toward the document discharge roller 119.

At this time, the scanner 118 reads data out of the sheet of document D to output it to an image processing circuit (not shown). The image processing circuit corrects, codes and compresses data output from the scanner 118, and then transmits it to the printer unit or the facsimile unit to print or transmit.

Thus, when the scanner 118 finishes reading data out of the sheet of document D, the sheet of document D is discharged by the document discharge roller 119 to which the rotation force of the driving motor 161 is transmitted through the first middle clutch gear 152, the first scanner clutch gear 153, the first power transmitting gear 159, the swing gear 181, the first idle gear 182, the second power transmitting gear 123, the small gear 124a of the first reduction gear 124, the fifth and sixth power transmitting gears 130 and 132, and the document discharge roller gear 133.

After that, if a print command is issued from the controller or PC, the carrier 141 having the print head 143 mounted thereon is moved in the direction of arrow A indicated in

FIG. 11, i.e. to the printing region, along a carrier shaft (not shown) and a guide rail (not shown) by a carrier driving gear (not shown), a carrier driving belt (not shown) and a power transmitting teeth portion (not shown), which transmit the power of a carrier driving motor (not shown).

Consequently, as shown in FIG. 11, the first actuating lever 150b is rotated in the counterclockwise direction by the support spring 157 and the first clutch spring 155 and then positioned at the first paper-feed driving position, which the first homologous clutch teeth 152b of the first middle clutch gear 152 is disengaged from the first scanner clutch teeth 153a and the first homologous paper-feed clutch teeth 152a is engaged with the first paper-feed clutch teeth 151a of the first paper-feed clutch gear 151. Accordingly, the power of the paper-feed/scanner driving motor 161 is not transmitted to the first power transmitting gear 159 of the scanner driving part 120, but to the second reduction gear 164 of the printer driving part 160.

At this state, the paper-feed/scanner driving motor 161 drives the driving motor gear 162 to rotate in the counterclockwise direction indicated in the arrow of dotted line of FIG. 6.

As a result, the paper pickup roller 144 is rotated in the counterclockwise direction through the first middle clutch gear 152, the first paper-feed clutch gear 151, the second reduction gear 164, the seventh, eighth, ninth, tenth and eleventh power transmitting gear 165, 167, 168, 169 and 169b, the first and second pickup idle gear 170 and 171, and the paper pickup roller gear 172, and thereby the sheet of paper P is picked up from the paper cassette 148 and transported toward the paper transport roller 145.

After that, when the paper sensor (not shown) senses the sheet of paper P conveyed to the paper transport roller 145, the controller again drives the paper-feed/scanner driving motor 161 in the other way, i.e. the clockwise direction indicated in the arrow of solid line of FIG. 6.

Consequently, the paper pickup roller 144 is idled by the one-way power transmitting device of the paper pickup roller assembly 147, whereas the paper transport roller 145 is rotated in the clockwise direction through the first middle clutch gear 152, the first paper-feed clutch gear 151, the second and fourth reduction gears 164 and 173, and the paper transport roller gear 174 to convey the sheet of paper P in a certain traveling distance per one revolution toward the print head 143.

Subsequently, when the sheet of paper P passes under the print head 143 by the paper transport roller 145, the print head 143 jets an ink through the ink jet nozzle to carry out the printing operation, while moving right and left along the carrier shaft 149 and the guide rail

by the carrier driving gear, the carrier driving belt and the power transmitting teeth portion, which transmit the power of the carrier driving motor.

After printing, the sheet of paper P is discharged outside by the paper discharge roller 146 to which the rotation force of the driving motor 161 is transmitted through the driving motor gear 162, the first middle clutch gear 152, the first paper-feed clutch gear 151, the first and fourth reduction gears 164 and 173, the paper transport roller gear 174, the twelfth power transmitting gear 175, and the paper discharge roller gear 176.

FIG. 13 shows another modified example of the power switching part 150' of the driving apparatus 100 according to the present invention.

In the second modified power switching part 150', a driving motor gear 162' of the paper-feed/scanner driving motor 161 is composed of first and second gear 162a and 162b, which are coaxially disposed in a spaced-apart relation with each other.

The second power switching part 150' is provided with a second clutch 150a' disposed among the driving motor 161, the scanner driving part 120 and the printer driving part 160 to move between a third power transmitting position (FIG. 13) transmitting the power of the driving motor 161 only to the second reduction gear 164 the printer driving part 160 and a fourth power transmitting position (not shown) transmitting the power of the driving motor 161 to both the second reduction gear 164 of the printer driving part 160 and the first power transmitting gear 159 of the scanner driving part 120, and a second actuating lever 150b' disposed on a moving path of the carrier 141 to be actuated by the carrier 141, thereby to move the second clutch 150a' between the third power transmitting position and the fourth power transmitting position.

The second clutch 150a' has a second rotation axis 154' disposed at the paper feed frame 105, a second paper-feed clutch gear 151' disposed at the second rotation axis 154' to engage with the second reduction gear 164 of the printer driving part 160 and the first gear 162a of the driving motor 161, a second scanner clutch gear 153' disposed at the second rotation axis 154' to engage with the first power transmitting gear 159 of the scanner driving part 120 positioned thereon and having second scanner clutch teeth 153a' formed on a face thereof which is located toward the second paper-feed clutch gear 151', a second middle clutch gear 152' disposed at the second rotation axis 154' between the second paper-feed clutch gear 151' and the second scanner clutch gear 153' to engage with or disengage from the second gear 162b of the driving motor 161 and having second homologous scanner clutch teeth 152b' formed on one face thereof opposite to the second scanner clutch teeth 153a' to engage therewith, and a second clutch spring 155' disposed between the second middle clutch

gear 152' and the second scanner clutch gear 153'.

Contrary to the first power transmitting part 150 explained with reference to FIGS. 8, 11 and 12, clutch teeth to switch the power are not formed between the second paper-feed clutch gear 151' and the second middle clutch gear 152'.

The second scanner clutch teeth 153a' and the second homologous scanner clutch teeth 152b' are respectively formed of a plurality of teeth, each having a cross section such as a triangle, a rectangle, a trapezoid and the like to easily switch the power to be transmitted, which are formed at the corresponding face of the gears 153' and 152'.

The second clutch spring 155' acts to elastically urge the second middle clutch gear 152' toward the second paper-feed clutch gear 151', thereby to allow the second middle clutch gear 152' to disengage from the second gear 162b of the driving motor 161 and at the same time to allow the second homologous scanner clutch teeth 152b' of the second middle clutch gear 152' to disengage from the second scanner clutch teeth 153a' of the second scanner clutch gear 153'.

The second actuating lever 150b' has a second ring-shaped one end 156a' disposed between the second middle clutch gear 152' and the second paper-feed clutch gear 151' to move between a second paper-feed driving position (FIG. 13) and a first paper-feed/scanner driving position (not shown), a second other end 156b' disposed on the moving path of the carrier 141 to be actuated by the carrier 141 when the carrier 141 is moved into the non-printing region and thereby to move the second one end 156a' to the first paper-feed/scanner driving position, and a second middle portion 156c' having a second support axis 158' supported at the paper feed frame 105 to allow the second one end 156a' to be movable between the second paper-feed driving position and the first paper-feed/scanner driving position by the second other end 156b'.The second paper-feed driving position is a position which the second one end 156a' allows the second middle clutch gear 152' to disengage from the second gear 162b of the driving motor 161 and at the same time allows the second homologous scanner clutch teeth 152b' of the second middle clutch gear 152' to disengage from the second scanner clutch teeth 153a' of the second scanner clutch gear 153', and the first paper-feed/scanner driving position is a position which the second one end 156a' moves the second middle clutch gear 152' toward the second scanner clutch gear 153' against a force of the second clutch spring 155' to allow the second middle clutch gear 152' to engage with the second gear 162b of the driving motor 161 and at the same time to allow the second homologous scanner clutch teeth 152b' of the second middle clutch gear 152' to engage with the second scanner clutch teeth 153a' of the second scanner clutch gear 153'.

The second actuating lever 150b' is always maintained at the second paper-feed driving position by a second support spring 157' having both ends supported by third and fourth support protrusions 157a' and 157b' and a middle portion fixed on a second support axis 158'.

Accordingly, as shown in FIG. 13, when the carrier 141 is at the printing region, the second actuating lever 150b' is positioned at the second paper-feed driving position by the second support spring 157' and the second clutch spring 155', so that the first middle clutch gear 152 is disengaged from the second gear 162b of the driving motor 161 and the second homologous scanner clutch teeth 152b' is disengaged from the second scanner clutch teeth 153a' of the second scanner clutch gear 153' to transmit the power of the paper-feed/scanner driving motor 161 to the second reduction gear 164 of the printer driving part 160 through the first gear 162a.

To the contrary, when the carrier 141 is moved to the non-printing region to actuate the first actuating lever 150b', the first actuating lever 150b' is rotated in the clockwise direction about the second support axis 158' by the carrier 141 to move the second middle clutch gear 152' toward the second scanner clutch gear 153' against the second support spring 157' and the second clutch spring 155' and then positioned at the first paper-feed/scanner driving position. As a result, on the condition that the first gear 162a of the driving motor 161 is engaged with the second reduction gear 164 of the printer driving part 160 through the second paper-feed clutch gear 151', the second middle clutch gear 152' is engaged with the second gear 162b of the driving motor 161 and at the same time, the second homologous scanner clutch teeth 152b' is engaged with the second scanner clutch teeth 153a' of the second scanner clutch gear 153', so that the power of the paper-feed/scanner driving motor 161 is transmitted to the first power transmitting gear 159 of the printer driving part 160 through the second gear 162b as well as to the second reduction gear 164 of the printer driving part 160 through the first gear 162a.

Thus, the second power transmitting part 150' has an disadvantage that the printer driving part 160 is operated during the scanning mode of driving the scanner driving part 120, but since the scanning mode has less frequency and time of use as compared with the printing mode, there is no problem raised.

FIG. 14 shows still another modified example of the power switching part 150" of the driving apparatus 100 according to the present invention.

In the third modified power switching part 150", a driving motor gear 162' of the paper-feed/scanner driving motor 161 is composed of one elongated gear 162" which are

extended in the axial direction.

The construction and operation of the third power switching part 150" are similar to those of the second power transmitting part 150' that are described above with reference to FIG.16, except that a third middle clutch gear 152' (shown in same reference as that of FIG. 13) is always engaged with the driving motor gear 162" even though it is moved between a second paper-feed driving position (FIG. 14) and a second paper-feed/scanner driving position (not shown) by a third actuating lever 150b' (shown in same reference as that of FIG. 13). Accordingly, the description about the construction and operation of the third power switching part 150" will be omitted here.

FIG. 15a shows further another modified example of the power switching part 150"' of the driving apparatus 100 according to the present invention.

In the fourth modified power switching part 150"', a driving motor gear 162' of the paper-feed/scanner driving motor 161 is composed of one gear 162 having a normal width, like as that of the first power transmitting part 150.

The fourth power switching part 150"' is provided with a fourth clutch 150a" disposed among the driving motor 161, the scanner driving part 120 and the printer driving part 160 to move between a third power transmitting position (FIG. 15a) transmitting the power of the driving motor 161 only to the second reduction gear 164 of the printer driving part 160 and a fourth power transmitting position (not shown) transmitting the power of the driving motor 161 to both the second reduction gear 164 of the printer driving part 160 and the first power transmitting gear 159 of the scanner driving part 120, and a fourth actuating lever 150b" disposed on a moving path of the carrier 141 to be actuated by the carrier 141, thereby to move the fourth clutch 150a" between the third power transmitting position and the fourth power transmitting position.

The fourth clutch 150b" is provides with a fourth rotation axis 154" disposed at the paper feed frame 105, a fourth paper-feed clutch gear 151" disposed at the fourth rotation axis 154" to engage with the second reduction gear 164 of the printer driving part 160 and the driving motor gear 162 of the driving motor 161 and having a fourth paper-feed clutch tooth 151a' formed on one face thereof, a fourth scanner clutch gear 153" disposed at the fourth rotation axis 154" to engage with the first power transmitting gear 159 of the scanner driving part 120 thereon and having fourth scanner clutch teeth 153a" formed on a face thereof which is located toward the fourth paper-feed clutch tooth 151a', a fourth middle clutch gear 152" disposed at the fourth rotation axis 154" between the fourth paper-feed clutch gear 151" and the fourth scanner clutch gear 153" and having a fourth homologous paper-feed clutch tooth

152a' formed on an inner circumference surface thereof opposite to the fourth paper-feed clutch tooth 151a' to engage therewith and fourth homologous scanner clutch teeth 152b" formed on a face thereof opposite to the fourth scanner clutch teeth 153a" to engage therewith, and a fourth clutch spring 155" disposed between the fourth middle clutch gear 152" and the fourth scanner clutch gear 153" to elastically urge the fourth middle clutch gear 152" toward the fourth paper-feed clutch gear 151", thereby to allow the fourth middle clutch gear 152" to separate from the fourth scanner clutch gear 153".

As shown in FIG. 15b taken along a line I-I of FIG. 15a, the fourth paper-feed clutch tooth 151a' and the fourth homologous paper-feed clutch tooth 152a' are respectively formed of a first sliding boss projected in the axial direction from the one face of the fourth paper-feed clutch gear 151" and a first sliding boss-engaging portion formed in the inner circumference surface of the fourth middle clutch gear 152" to slidably receive the first sliding boss in the axial direction, so that the fourth paper-feed clutch tooth 151a' is always engaged with the fourth homologous paper-feed clutch tooth 152a' to transmit a power of the driving motor 161. The first sliding boss has a first sliding key or tooth 151a" formed to be extended in the axial direction on an outer circumference surface thereof, and the first sliding boss-engaging portion has a first receiving groove formed in a shape corresponding to the first sliding key 151a" at the inner circumference surface of the fourth middle clutch gear 152".

Also, the fourth scanner clutch teeth 153a" and the fourth homologous scanner clutch teeth 152b" are respectively formed of a plurality of teeth, each having a cross section such as a triangle, a rectangle, a trapezoid and the like to easily switch the power to be transmitted, which are formed at the corresponding face of the gears 153" and 152".

The second actuating lever 150b" has a fourth ring-shaped one end 156a" disposed to receive the fourth rotation axis 154" between the fourth middle clutch gear 152" and the fourth paper-feed clutch gear 151" to move between a fourth paper-feed driving position (FIG. 15a) and a third paper-feed/scanner driving position (not shown), a fourth other end 156b" disposed on the moving path of the carrier 141 to be actuated by the carrier 141 when it is moved to the non-printing region and thereby to move the fourth one end 156a" to the third paper-feed/scanner driving position, and a fourth middle portion 156c" having a fourth support axis 158" supported at the paper feed frame 105 to allow the fourth one end 156a" to be movable between the fourth paper-feed driving position and the third paper-feed/scanner driving position by the fourth other end 156b". The fourth paper-feed driving position is a position which the fourth one end 156a" allows the fourth homologous scanner clutch teeth

152b" to disengage from the fourth scanner clutch teeth 153a", and the third paper-feed/scanner driving position is a position which the fourth one end 156a" moves the fourth middle clutch gear 152" toward the fourth scanner clutch gear 153" against a force of the fourth clutch spring155" to allow the fourth homologous scanner clutch teeth 152b" to engage with the fourth scanner clutch teeth 152a".

The fourth actuating lever 150b" is always maintained at the fourth paper-feed driving position by a fourth support spring 157" having both ends supported by seventh and eighth support protrusions 157b" (only one shown) and a middle portion fixed on a fourth support axis 158".

Accordingly, when the carrier 141 is at the printing region, the fourth actuating lever 150b" is positioned at the fourth paper-feed driving position by the fourth support spring 157" and the fourth clutch spring 155", so that the power of the paper-feed/scanner driving motor 161 is transmitted to the second reduction gear 164 of the printer driving part 160 through the fourth paper-feed clutch gear 151".

To the contrary, when the carrier 141 is at the non-printing region, the fourth actuating lever 150b" is positioned at the third paper-feed/scanner driving position by the carrier 141 to move the fourth middle clutch gear 152" toward the fourth scanner clutch gear 153" against the fourth support spring 157" and the fourth clutch spring 155". Accordingly, at this time, on the condition that the first sliding key 151a" extended in the axial direction on an outer circumference surface of the first sliding boss 151a' is messed with the first receiving groove of the first sliding boss-engaging portion 152a', the fourth homologous scanner clutch teeth 152b" of the fourth middle clutch gear 152" is engaged with the fourth scanner clutch teeth 153a" of the fourth scanner clutch gear 153", and thereby the power of the paper-feed/scanner driving motor 161 is transmitted to the first power transmitting gear 159 of the printer driving part 160 as well as to the second reduction gear 164 of the printer driving part 160.

Thus, like as the second and third power switching parts 150' and 150" described above, the fourth power transmitting part 150"' has an disadvantage that the printer driving part 160 is operated during the scanning mode of driving the scanner driving part 120, but since the scanning mode has less frequency and time of use as compared with the printing mode, there is no problem raised.

FIG. 16 shows also another modified example of the power switching part 150"" of the driving apparatus 100 according to the present invention.

In the fifth modified power switching part 150"", a driving motor gear of the paper-

feed/scanner driving motor 161 is composed of one gear 162 having a normal width, like as that of the first power transmitting part 150.

Similarly with the second, third and fourth power switching parts 150', 150" and 150"' described above, the fifth power switching part 150"" is provided with a fifth clutch 150a"' disposed among the driving motor 161, the scanner driving part 120 and the printer driving part 160 to move between a third power transmitting position (FIG. 16) transmitting the power of the driving motor 161 only to the second reduction gear 164 the printer driving part 160 and a fourth power transmitting position (not shown) transmitting the power of the driving motor 161 to both the second reduction gear 164 of the printer driving part 160 and the first power transmitting gear 159 of the scanner driving part 120, and a fifth actuating lever 150b"' disposed on a moving path of the carrier 141 to be actuated by the carrier 141, thereby to move the fifth clutch 150a"' between the third power transmitting position and the fourth power transmitting position.

The fifth clutch 150b"' has a fifth rotation axis 154"' disposed at the paper feed frame 105, a fifth paper-feed clutch gear 151"' disposed at the fifth rotation axis 154"' to engage with the second reduction gear 164 of the printer driving part 160 and the driving motor gear 162 of the driving motor 161 and having a fifth paper-feed clutch tooth 151a"' formed on one face thereof, a fifth scanner clutch gear 152"' disposed at the fifth rotation axis 154"' to be movable between a paper-feeding position (FIG. 16) disengaging from the first power transmitting gear 159 of the scanner driving part 120 thereon and a paper-feeding/scanning position (not shown) engaging with the first power transmitting gear 159 of the scanner driving part 120 thereon and having a fifth scanner clutch tooth 152a"' formed at an inner circumference surface thereof to engage the fifth paper-feed clutch tooth 151a"', and a fifth clutch spring 155"' disposed between the fifth scanner clutch gear 152"' and a top of the fifth rotation axis 154"' to elastically urge the fifth scanner clutch gear 152"' toward the fifth paper-feed clutch gear 151"', thereby to maintain the fifth scanner clutch gear 152"' at the paper-feeding position.

Like as the fourth paper-feed clutch tooth 151a' and the forth homologous scanner clutch tooth 152a' of the fourth power transmitting part 150"' shown in FIG. 15a, the fifth paper-feed clutch tooth 151a"' and the fifth scanner clutch tooth 152a"' are respectively formed of a second sliding boss projected in the axial direction from the one face of the fifth paper-feed clutch gear 151"' and a second sliding boss-engaging portion formed at the inner circumference surface of the fifth scanner clutch gear 152"' to receive the second sliding boss to be slidable in the axial direction, so that the fifth paper-feed clutch tooth 151a"' and

the fifth scanner clutch tooth 152a"' are always engaged with each other to transmit a power of the driving motor 161. The second sliding boss has a second sliding key or tooth 151a"" formed to be extended in the axial direction on an outer circumference surface thereof, and the second sliding boss-engaging portion has a second receiving groove formed in a shape corresponding to the second sliding key 151a"" at the inner circumference surface of the fifth scanner clutch gear 152"'.

The fifth actuating lever 150b"' is provided with a fifth ring-shaped one end 156a"' disposed to receive the fifth rotation axis 154"' between the fifth scanner clutch gear 152"' and the fifth paper-feed clutch gear 151"' to move between a fifth paper-feed driving position (FIG. 16) and a fourth paper-feed/scanner driving position (not shown), a fifth other end 156b"' disposed on the moving path of the carrier 141 to be actuated by the carrier 141 when it is moved to the non-printing region and thereby to move the fifth one end 156a"' to the fourth paper-feed/scanner driving position, and a fifth middle portion 156c"' having a fifth support axis 158"' supported at the paper feed frame 105 to allow the fifth one end 156a"' to be movable between the fifth paper-feed driving position and the fourth paper-feed/scanner driving position by the fifth other end 156b"'.The fifth paper-feed driving position is a position which the fifth one end 156a"' allows the fifth scanner clutch gear 152"' to be maintained at the paper-feeding position, and the fourth paper-feed/scanner driving position is a position which the fifth one end 156a"' moves the fifth scanner clutch gear 152"' toward the first power transmitting gear 159 of the scanner driving part 120 against a force of the fifth clutch spring 155"' to allow the fifth scanner clutch gear 152"' to be maintained at the paper-feeding/scanning position

The fifth actuating lever 150b"' is always maintained at the fifth paper-feed driving position by a fifth support spring 157"' having both ends supported by ninth and tenth support protrusions 157b"' (only one shown) and a middle portion fixed on a fifth support axis 158"'.

Accordingly, when the carrier 141 is at the printing region, the fifth actuating lever 150b"' is positioned at the fifth paper-feed driving position by the fifth support spring 157"' and the fifth clutch spring 155"', so that the power of the paper-feed/scanner driving motor 161 is transmitted to the second reduction gear 164 of the printer driving part 160.

To the contrary, when the carrier 141 is at the non-printing region, the fifth actuating lever 150b"' is positioned at the fourth paper-feed/scanner driving position by the carrier 141 to move the fifth scanner clutch gear 152"' toward the first power transmitting gear 159 against the fifth support spring 157"' and the fifth clutch spring 155"'. Accordingly, at this time, on the condition that the second sliding key 151a"" extended in the axial

direction on the outer circumference surface of the second sliding boss 151a"' is messed with the second receiving groove of the second sliding boss-engaging portion 152a"', the fifth scanner clutch gear 152"' is engaged with the first power transmitting gear 159 of the printer driving part 160, and thereby the power of the paper-feed/scanner driving motor 161 is transmitted to the first power transmitting gear 159 as well as to the second reduction gear 164 of the printer driving part 160.

Like as the second, third and fourth power switching parts 150', 150" and 150"' described above, the fifth power transmitting part 150"" also has an disadvantage that the printer driving part 160 is operated during the scanning mode of driving the scanner driving part 120, but since the scanning mode has less frequency and time of use as compared with the printing mode, there is no problem raised.

**[Effect of the invention]**

As apparent from the foregoing description, it can be appreciated that the driving apparatus of the multi-function machine according to the present invention provides an effect which can drive the scanner driving part and the printer driving part by one driving motor, and thereby to reduce the fabrication cost.

Although the preferred embodiment of the present invention has been described, it will be understood by those skilled in the art that the present invention should not be limited to the described preferred embodiment, but various exchanges and modifications can be made within the spirit and the scope of the present invention. Accordingly, the scope of the present invention is not limited within the described range but the following claims.

What is claimed is:

1. A driving apparatus of a multi-function machine including a scanner unit scanning data recorded on a sheet of document and having a document transport part to transport the sheet of document, and a printer unit printing data on a sheet of paper for an output and having carrier including a print head with an ink jet nozzle mounted thereon to carry out the printing operation by moving the print head, comprising:

one driving motor;

a scanner driving part driving the scanner unit;

a printer driving part driving the printer unit; and

a power switching part disposed among the driving motor, the scanner driving part and the printer driving part to selectively transmit a power of the driving motor to at least one of the scanner driving part and the printer driving part.

2. The driving apparatus as claimed in claim 1, wherein the power switching part comprises,

a first clutch disposed among the driving motor, the scanner driving part and the printer driving part to move between a first power transmitting position transmitting the power of the driving motor to the scanner driving part and a second power transmitting position transmitting the power of the driving motor to the printer driving part; and

a first actuating lever disposed on a moving path of the carrier to be actuated by the carrier, thereby to move the first clutch between the first power transmitting position and the second power transmitting position.

3. The driving apparatus as claimed in claim 2,

wherein the first clutch comprises,

a first rotation axis disposed at a frame;

a first paper-feed clutch gear disposed at the

first rotation axis to engage with the printer driving part, and having first paper-feed clutch teeth formed on a face thereof;

a first scanner clutch gear disposed at the first

rotation axis to engage with the scanner driving part, and having first scanner clutch teeth formed on a face thereof which is located toward the first paper-feed clutch teeth;

a first middle clutch gear disposed at the first rotation axis between the first paper-

feed clutch gear and the first scanner clutch gear to engage with the driving motor, and having first homologous paper-feed clutch teeth formed on one face thereof opposite to the first paper-feed clutch teeth to engage with the first paper-feed clutch teeth, and first homologous scanner clutch teeth formed on the other face thereof opposite to the first scanner clutch teeth to engage with the first scanner clutch teeth; and

a first clutch spring disposed between the first middle clutch gear and the first scanner clutch gear to elastically urge the first middle clutch gear toward the first paper-feed clutch gear, thereby to allow the first homologous paper-feed clutch teeth of the first middle clutch gear to engage with the first paper-feed clutch teeth of the first paper-feed clutch gear.

4. The driving apparatus as claimed in claim 3,

wherein the first paper-feed clutch teeth, the first scanner clutch teeth, the first homologous paper-feed clutch teeth and the first homologous scanner clutch teeth are respectively formed of a plurality of teeth, each having a cross section such as a triangle, a rectangle, a trapezoid and the like to easily switch the power to be transmitted, which are formed at the corresponding faces of the gears.

5. The driving apparatus as claimed in claim 3,

wherein the first actuating lever comprises,

a first one end disposed between the first middle clutch gear and the first paper-feed clutch gear to move between a first paper-feed driving position and a first scanner driving position, the first paper-feed driving position being a position which the first one end allows the first homologous paper-feed clutch teeth to engage with the first paper-feed clutch teeth, and the first scanner driving position being a position which the first one end moves the first middle clutch gear toward the first scanner clutch gear against a force of the first clutch spring to allow the first homologous paper-feed clutch teeth to disengage from the first paper-feed clutch teeth and to allow the first homologous scanner clutch teeth to engage with the first scanner clutch teeth;

a first other end disposed on the moving path of the carrier to be actuated by the carrier when the carrier is moved and thereby to move the first one end to the first scanner driving position; and

a first middle portion having a first support axis supported at the frame to allow the first one end to be movable between the first paper-feed driving position and the first scanner driving position by the first other end.

6. The driving apparatus as claimed in claim 1,

wherein the power switching part comprises,

a second clutch disposed among the driving motor, the scanner driving part and the printer driving part to move between a third power transmitting position transmitting the power of the driving motor to the printer driving part and a fourth power transmitting position transmitting the power of the driving motor to both the printer driving part and the scanner driving part; and

a second actuating lever disposed on a moving path of the carrier to be actuated by the carrier, thereby to move the second clutch between the third power transmitting position and the fourth power transmitting position.

7. The driving apparatus as claimed in claim 6,

wherein a driving motor gear of the driving motor comprises first and second gears that are coaxially disposed in a spaced-apart relation with each other.

8. The driving apparatus as claimed in claim 7,

wherein the second clutch comprises,

a second rotation axis disposed at a frame;

a second paper-feed clutch gear disposed at the second rotation axis to engage with the printer driving part and the first gear of the driving motor;

a second scanner clutch gear disposed at the second rotation axis to engage with the scanner driving part, and having second scanner clutch teeth formed on a face thereof which is located toward the second paper-feed clutch gear;

a second middle clutch gear disposed at the second rotation axis between the second paper-feed clutch gear and the second scanner clutch gear to engage with or disengage from the second gear of the driving motor, and having second homologous scanner clutch teeth formed on one face thereof opposite to the second scanner clutch teeth to engage with the second scanner clutch teeth; and

a second clutch spring disposed between the second middle clutch gear and the second scanner clutch gear to elastically urge the second middle clutch gear toward the second paper-feed clutch gear, thereby to allow the second middle clutch gear to disengage from the second gear of the driving motor, and at the same time to allow the second

homologous scanner clutch teeth of the second middle clutch gear to disengage from the second scanner clutch teeth of the second scanner clutch gear.

9. The driving apparatus as claimed in claim 8,

wherein the second scanner clutch teeth and the second homologous scanner clutch teeth are respectively formed of a plurality of teeth, each having a cross section such as a triangle, a rectangle, a trapezoid and the like to easily switch the power to be transmitted, which are formed at the corresponding faces of the gears.

10. The driving apparatus as claimed in claim 8,

wherein the second actuating lever comprises,

a second one end disposed between the second middle clutch gear and the second paper-feed clutch gear to move between a second paper-feed driving position and a first paper-feed/scanner driving position, the second paper-feed driving position being a position which the second one end allows the second middle clutch gear to disengage from the second gear of the driving motor and at the same time allows the second homologous scanner clutch teeth to disengage from the second scanner clutch teeth, and the first paper-feed/scanner driving position being a position which the second one end moves the second middle clutch gear toward the second scanner clutch gear against a force of the second clutch spring to allow the second middle clutch gear to engage with the second gear of the driving motor and at the same time to allow the second homologous scanner clutch teeth to engage with the second scanner clutch teeth;

a second other end disposed on the moving path of the carrier to be actuated by the carrier when the carrier is moved and thereby to move the second one end to the first paper-feed/scanner driving position; and

a second middle portion having a second support axis supported at the frame to allow the second one end to be movable between the second paper-feed driving position and the first paper-feed/scanner driving position by the second other end.

11. The driving apparatus as claimed in claim 6,

wherein a driving motor gear of the driving motor comprises one elongated gear that are extended in the axial direction.

12. The driving apparatus as claimed in claim 11,

wherein the second clutch comprises,

a third rotation axis disposed at a frame;

a third paper-feed clutch gear disposed at the

third rotation axis to always engage with the printer driving part and one end of the driving motor gear;

a third scanner clutch gear disposed at the third

rotation axis to engage with the scanner driving part, and having third scanner clutch teeth formed on a face thereof which is located toward the third paper-feed clutch gear;

a third middle clutch gear disposed at the third rotation axis between the third paper-feed clutch gear and the third scanner clutch gear to always engage with the other end of the driving motor gear of the driving motor, and having third homologous scanner clutch teeth formed on one face thereof opposite to the third scanner clutch teeth to engage with the third scanner clutch teeth; and

a third clutch spring disposed between the third middle clutch gear and the third scanner clutch gear to elastically urge the third middle clutch gear toward the third paper-feed clutch gear, thereby to allow the third homologous scanner clutch teeth of the third middle clutch gear to disengage from the third scanner clutch teeth of the third scanner clutch gear.

13. The driving apparatus as claimed in claim 12,

wherein the third scanner clutch teeth, and the third homologous scanner clutch teeth are respectively formed of a plurality of teeth, each having a cross section such as a triangle, a rectangle, a trapezoid and the like to easily switch the power to be transmitted, which are formed at the corresponding faces of the gears.

14. The driving apparatus as claimed in claim 12,

wherein the second actuating lever comprises,

a third one end disposed between the third middle clutch gear and the third paper-feed clutch gear to move between a third paper-feed driving position and a second paper-feed/scanner driving position, the third paper-feed driving position being a position which the third one end allows the third homologous scanner clutch teeth to disengage from the third scanner clutch teeth, and the second paper-feed/scanner driving position being a position which the third one end moves the third middle clutch gear toward the third scanner clutch gear against a force of the third clutch spring to allow the third homologous scanner clutch teeth to engage with the third scanner clutch teeth;

a third other end disposed on the moving path of the carrier to be actuated by the carrier when the carrier is moved and thereby to move the third one end to the second paper-feed/scanner driving position; and

a third middle portion having a third support axis supported at the frame to allow the third one end to be movable between the third paper-feed driving position and the second paper-feed/scanner driving position by the third other end.

15. The driving apparatus as claimed in claim 6,

wherein the second clutch comprises,

a fourth rotation axis disposed at a frame;

a fourth paper-feed clutch gear disposed at the fourth rotation axis to engage with the printer driving part and the driving motor, and having at least one fourth paper-feed clutch tooth formed on one face thereof;

a fourth scanner clutch gear disposed at the fourth rotation axis to engage with the scanner driving part, and having fourth scanner clutch teeth formed on a face thereof which is located toward the fourth paper-feed clutch tooth;

a fourth middle clutch gear disposed at the fourth rotation axis between the fourth paper-feed clutch gear and the fourth scanner clutch gear, and having at least one fourth homologous paper-feed clutch tooth formed on an inner circumference surface thereof opposite to the fourth paper-feed clutch tooth to engage with the fourth paper-feed clutch tooth and fourth homologous scanner clutch teeth formed on a face thereof opposite to the fourth scanner clutch teeth to engage with the fourth scanner clutch teeth; and

a fourth clutch spring disposed between the fourth middle clutch gear and the fourth scanner clutch gear to elastically urge the fourth middle clutch gear toward the fourth paper-feed clutch gear, thereby to allow the fourth middle clutch gear to separate from the fourth scanner clutch gear.

16. The driving apparatus as claimed in claim 15,

wherein the fourth paper-feed clutch tooth and the fourth homologous paper-feed clutch tooth are respectively formed of a first sliding boss projected in the axial direction from the one face of the fourth paper-feed clutch gear and a first sliding boss-engaging portion formed in the inner circumference surface of the fourth middle clutch gear to receive the first sliding boss to be slidable in the axial direction, so that the fourth paper-feed clutch tooth is always engaged with the fourth homologous paper-feed clutch tooth to transmit a power of the

driving motor, the first sliding boss having one of a first sliding key and a first sliding tooth formed to be extended in the axial direction on an outer circumference surface thereof, and the first sliding boss-engaging portion having a first receiving groove formed in a shape corresponding to one of the first sliding key and the first sliding tooth at the inner circumference surface of the fourth middle clutch gear.

17. The driving apparatus as claimed in claim 16,

wherein the fourth scanner clutch teeth and the fourth homologous scanner clutch teeth are respectively formed of a plurality of teeth, each having a cross section such as a triangle, a rectangle, a trapezoid and the like to easily switch the power to be transmitted, which are formed at the corresponding faces of the gears.

18. The driving apparatus as claimed in claim 15,

wherein the second actuating lever comprises,

a fourth one end disposed between the fourth middle clutch gear and the fourth paper-feed clutch gear to move between a fourth paper-feed driving position and a third paper-feed/scanner driving position, the fourth paper-feed driving position being a position which the fourth one end allows the fourth homologous scanner clutch teeth to disengage from the fourth scanner clutch teeth, and the third paper-feed/scanner driving position being a position which the fourth one end moves the fourth middle clutch gear toward the fourth scanner clutch gear against a force of the fourth clutch spring to allow the fourth homologous scanner clutch teeth to engage with the fourth scanner clutch teeth;

a fourth other end disposed on the moving path of the carrier to be actuated by the carrier when the carrier is moved and thereby to move the fourth one end to the third paper-feed/scanner driving position; and

a fourth middle portion having a fourth support axis supported at the frame to allow the fourth one end to be movable between the fourth paper-feed driving position and the third paper-feed/scanner driving position by the fourth other end.

19. The driving apparatus as claimed in claim 6,

wherein the second clutch comprises,

a fifth rotation axis disposed at a frame;

a fifth paper-feed clutch gear disposed at the

fifth rotation axis to engage with the printer driving part and the driving motor, and having at

least one fifth paper-feed clutch tooth formed on one face thereof;

a fifth scanner clutch gear disposed at the fifth rotation axis to be movable between a paper-feeding position and a paper-feeding/scanning position, and having at least one fifth scanner clutch tooth formed at an inner circumference surface thereof to engage the fifth paper-feed clutch tooth, the paper-feeding/scanning position being a position which the fifth scanner clutch gear is engaged with the scanner driving part and the paper-feeding position being a position which fifth scanner clutch gear is disengaged from the scanner driving part; and

a fifth clutch spring disposed between the fifth scanner clutch gear and a top of the fifth rotation axis to elastically urge the fifth scanner clutch gear toward the fifth paper-feed clutch gear to maintain the fifth scanner clutch gear at the paper-feeding position.

20. The driving apparatus as claimed in claim 19, wherein the fifth paper-feed clutch tooth and the fifth scanner clutch tooth are respectively formed of a second sliding boss projected in the axial direction from the one face of the fifth paper-feed clutch gear and a second sliding boss-engaging portion formed at the inner circumference surface of the fifth scanner clutch gear to receive the second sliding boss to be slidable in the axial direction, so that the fifth paper-feed clutch tooth is always engaged with the fifth scanner clutch tooth to transmit a power of the driving motor, the second sliding boss the having one of a second sliding key and a second sliding tooth formed to be extended in the axial direction on an outer circumference surface thereof, and the second sliding boss-engaging portion having a second receiving groove formed in a shape corresponding to one of the second sliding key and the second sliding tooth at the inner circumference surface of the fifth scanner clutch gear.

21. The driving apparatus as claimed in claim 19, wherein the second actuating lever comprises,

a fifth one end disposed between the fifth scanner clutch gear and the fifth paper-feed clutch gear to move between a fifth paper-feed driving position and a fourth paper-feed/scanner driving position, the fifth paper-feed driving position being a position which the fifth one end allows the fifth scanner clutch gear to be maintained at the paper-feeding position, and the fourth paper-feed/scanner driving position being a position which the fifth one end moves the fifth scanner clutch gear toward the scanner driving part against a force of the fifth clutch spring to allow the fifth scanner clutch gear to be maintained at the paper-

feeding/scanning position;

a fifth other end disposed on the moving path of the carrier to be actuated by the carrier when the carrier is moved and thereby to move the fifth one end to the fourth paper-feed/scanner driving position; and

a fifth middle portion having a fifth support axis supported at the frame to allow the fifth one end to be movable between the fifth paper-feed driving position and the fourth paper-feed/scanner driving position by the fifth other end.

22. The driving apparatus as claimed in claim 1,

further comprising a swing gear train disposed between the power switching part and the scanner driving part to facilitate a gear assembling therebetween.